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In the Claims

Please amend the correspondingly numbered claims as follows. The claims in the listing replace all prior claims in the application.

Claims 1-10 (cancelled)

Claim 11 (previously cancelled)

Claims 12-21 (cancelled)

Claim 22 (currently amended): ~~The device as in claim 13,~~ A device, comprising:

a substrate;

a first fiber having a first end facet and fixed on said substrate;

a second fiber, fixed on said substrate and parallel to said first fiber, having a second end facet which opposes said first end facet with a gap to directly receive light from said first end facet without coupling optics therebetween;

a blade having a first blade surface facing said first end facet and forming a first angle with respect to said first end facet and a second blade surface facing said second end facet and forming a second angle with respect to said first blade surface, said blade movably engaged to said substrate to move in and out of said gap at various positions to allow said blade to intercept a variable portion of the beam in said gap to adjust an amount of light directly coupled from said first fiber into said second fiber;

an actuator built on the said substrate and engaged to said blade to adjust a position of said blade in said gap in response to a control signal;

an optical coupler to split a fraction of light received by said second fiber from said second end facet to produce a monitor beam;

an optical detector to receive said monitor beam to produce a detector output; and

a feedback circuit, coupled to said optical detector and said actuator to control a position of said blade to control an amount of light received by said second fiber in response to said detector output;

wherein said feedback circuit produces a bias signal to set said actuator to a bias position at which movement of said actuator is damped with respect to a change in said control signal to said actuator.

Claim 23 (currently amended): The device as in claim [[1]] 22, wherein said actuator includes two serpentine torsional hinges which define a rotational axis around which said actuator rotates said blade.

Claim 24 (currently amended): The device as in claim [[1]] 22, wherein said actuator includes two serpentine hinges.

Claim 25 (cancelled)

Claim 26 (previously presented): A method, comprising:

causing end facets of two fibers to face each other with a gap;

causing said gap to be at a value to allow for direct optical coupling between said two fibers without coupling optics therebetween to have an optical loss less than about 1dB; and

causing a blade to move in said gap to interfere with said direct optical coupling by optical refraction or reflection, wherein said blade has a blade surface at an angle with respect to an end facet of a fiber that outputs light to said blade surface;

wherein said blade is engaged to a rotational actuator which has a set of stationary conductive teeth and a set of movable teeth interleaving with said stationary teeth, wherein said stationary and said movable teeth interact electrostatically to move said movable teeth in response to a potential difference, the method further comprising:

causing a bias in said potential difference to make said rotational actuator respond approximately linearly and with damping with respect to a change in said potential difference.

Claim 27 (currently amended): The method as in claim [[25]] 26, further comprising:

causing a fraction of light coupled through said gap to be converted into an electrical signal indicative of an amount of light coupled through said gap; and

causing a position of said blade in said gap to be controlled according to said [[an]] amount of light to control said amount of light coupled through said gap.

Claims 28-30 (cancelled)

Claim 31 (currently amended): ~~The device as in claim 28,~~ A device, comprising:

a substrate;

a first fiber having a first end facet and fixed on said substrate;

a second fiber, fixed on said substrate and parallel to said first fiber, having a second end facet which opposes said first end facet by a gap to directly receive light from said first end facet without coupling optics therebetween;

a blade having a first blade surface facing said first end facet and forming a first angle with respect to said first end facet and a second blade surface facing said second end facet and forming a second angle with respect to said first blade surface, said blade movably engaged to said substrate to move in and out of said gap at various positions some of which allow said blade to intercept at least a portion of the beam in said gap to vary an amount of light directly coupled from said first fiber into said second fiber; and

an actuator located on said substrate and engaged to said blade to control motion of said blade, wherein said actuator is an integrated micro mechanical device with a stationary part and a movable part with a first set of movable conductive teeth, said movable part movably engaged to said stationary part to have positions at which said movable teeth spatially interleave with said stationary conductive teeth to electrostatically interact to control movement of said movable part in response to a control voltage applied between said stationary conductive teeth and said movable conductive teeth;

wherein said substrate includes a groove in which said first and said second fibers are located, said groove having a protruded feature at a location of said gap and with a length along said groove to be equal to a desired spacing of said gap, and wherein said first and said second fibers are

placed on opposite sides of said protruded feature to have said first end facet and said second end facet positioned to contact said protruded feature.

Claim 32 (currently amended): A method, comprising:

causing a layer of a selected material to be formed over a substrate surface;

causing said layer to be processed to form a first pattern that selectively exposes and covers said substrate surface;

causing exposed areas on said substrate surface to be etched to a first depth;

causing a second substrate to be bonded to said patterned layer over said substrate surface;

causing said second substrate to be thinned to a desired thickness to form a thin layer;

causing a second layer of said selected material to be formed over a second substrate surface of said second substrate that is opposite to said surface bonded to said patterned layer;

causing said second layer to be processed to form a second pattern that selectively exposes and covers said second substrate surface, wherein selectively covered areas include a first group and a second group;

causing a photoresist mask layer to be formed over said second layer in only said first group to leave said second layer in said second group exposed;

causing exposed areas on said second substrate surface to be etched to a first depth without penetrating said thin layer to form first etched exposed areas;

causing said exposed second layer in said second group that is not covered by said photoresist mask layer to be removed by a dielectric etching process ~~processing~~ without etching exposed areas on said second substrate surface;

causing etching of exposed areas on said second substrate surface including said first etched exposed areas and areas of said second group that are above said first etched exposed areas on said second substrate surface;

causing said etching to be stopped when said first etched exposed areas are etched through to make exposed areas in said second group thinner than said areas in said first group; and

causing said second layer covering said first group to be removed.

Claim 33 (previously presented): The method as in claim 32, wherein said substrate material includes silicon and said selected material includes silicon oxide or silicon nitride.

Claim 34 (previously presented) The method as in claim 32, wherein said substrate material includes a silicon-on-insulator.

Claims 35-38 (cancelled)

Claim 39 (currently amended): ~~The attenuator of claim 38,~~ An optical attenuator comprising:

a. a first facet launching an optical beam;

b. a second facet separated from the first facet by a gap and positioned to receive the optical beam;

c. a blade extending through the gap and intersecting at least a portion of the beam, the blade including:

i. a first blade surface facing the first facet; and

ii. a second blade surface facing the second facet;

iii. wherein the first and second blade surfaces are nonparallel;

d. an electromechanical actuator connected to the blade and adjusting the blade within the gap in response to control signals; and

e. a control circuit electrically connected to the actuator and generating the control signals;

f. wherein the control circuit electrically biases the control signals to place the electro-mechanical actuator in a linear response range when intersecting the portion of the optical beam;

g. wherein the actuator comprises a plurality of movable teeth, connected to the blade, and a plurality of stationary teeth; and

h. wherein the actuator is a rotational actuator.

Claim 40 (currently amended) ~~The attenuator of claim 35,~~ An optical attenuator comprising:

a. a first facet launching an optical beam;

b. a second facet separated from the first facet by a gap and positioned to receive the optical beam;

c. a blade extending through the gap and intersecting at least a portion of the beam, the blade including:

i. a first blade surface facing the first facet; and

ii. a second blade surface facing the second facet;

iii. wherein the first and second blade surfaces are nonparallel;

d. an electromechanical actuator connected to the blade and adjusting the blade within the gap in response to control signals; and

e. a control circuit electrically connected to the actuator and generating the control signals;

f. wherein the control circuit produces a bias signal setting the actuator to a bias position at which movement of the actuator is damped with respect to a change in the control signals.

Claim 41 (currently amended): The attenuator of claim 40 [[35]], wherein the electromechanical actuator is an electro-magnetic actuator.

Claims 42-44 (cancelled)

Claim 45 (currently amended): ~~The attenuator of claim 44,~~ An attenuator comprising:

a. a first facet launching a beam;
b. a second facet separated from the first facet by a gap and receiving the beam;
c. a blade extending through the gap and intersecting at least a portion of the beam, the blade attenuating the portion of the beam by refraction;
d. an electromechanical actuator connected to the blade and adjusting the blade within the gap in response to control signals; and
e. a control circuit electrically connected to the actuator and generating the control signals;
f. wherein the actuator comprises a plurality of movable teeth, connected to the blade, and a plurality of stationary teeth; and
g. wherein the actuator is a rotational actuator.

Claim 46 (currently amended): ~~The attenuator of claim 42,~~ An attenuator comprising:
a. a first facet launching a beam;
b. a second facet separated from the first facet by a gap and receiving the beam;
c. a blade extending through the gap and intersecting at least a portion of the beam, the blade attenuating the portion of the beam by refraction;
d. an electromechanical actuator connected to the blade and adjusting the blade within the gap in response to control signals; and

e. a control circuit electrically connected to the actuator and generating the control signals;

f. wherein the control circuit produces a bias signal setting the actuator to a bias position at which movement of the actuator is damped with respect to a change in the control signals.

Claim 47 (currently amended): The attenuator of claim 46 [[42]], the blade including a first blade surface facing the first facet and a second blade surface facing the second facet, wherein the first and second blade surfaces are nonparallel.

Claim 48 (currently amended): The attenuator of claim 46 [[42]], wherein the blade is transparent.

Claim 49 (currently amended): The attenuator of claim 46 [[42]], wherein the electromechanical actuator is an electro-magnetic actuator.

Claims 50-60 (cancelled)